CLAIMS

What is claimed is:

1. A method for screening a proteome, comprising the steps of:

a) directing compounds of a proteome through an array of affinity elements, whereby at least one compound of the proteome binds specifically to at least one of said affinity elements;

b) washing the array, whereby non-specifically bound compounds of the proteome are eluted from the array; and

c) directing at least one eluent through the array by centrifugal force, wherein said eluent releases said bound compound, whereby said compound is eluted from the affinity element as a component of an eluate, thereby screening the proteome.

2. The method of Claim 1, wherein at least one element of the array of affinity elements includes at least one physiologic target candidate of a protein component of the proteome.

3. The method of Claim 2, wherein the physiologic target candidate is adenosine triphosphate or a structural analog thereof.

4. The method of Claim 3, wherein the target candidate is adenosine triphosphate.

5. The method of Claim 4, wherein the adenosine triphosphate is bound to an inert support of the element in a uniform orientation.

6. The method of Claim 5, wherein the adenosine triphosphate is bound to the inert support at a gamma phosphate portion of the adenosine triphosphate, whereby an

adenosine portion of the adenosine triphosphate is exposed to solutions directed through the array.

7. The method of Claim 6, wherein the eluent includes purine or at least one purine analog.

8. The method of Claim 7, wherein the purine analog is a naturally-occurring purine analog.

9. The method of Claim 8, wherein the purine analog is selected from the group consisting of NADH, AMP, ADP and ATP.

10. The method of Claim 5, wherein the concentration of adenosine triphosphate on at least a portion of the elements is in a range of between about 10 and about 50 μmoles per milliliter of the element.

11. The method of Claim 10, wherein the concentration of adenosine triphosphate is about 10 μmoles per milliliter of the element.

12. The method of Claim 5, wherein the amount of proteome directed through the array is sufficient to recover between about 0.1 pmol and about 1 pmol of a component of the proteome that binds to adenosine triphosphate.

13. The method of Claim 12, wherein the eluent has a concentration of protein in a range of between about 0.1mg/ml and about 1g/ml.

14. The method of Claim 13, wherein the concentration of protein in the eluent is about 10 mM.

15. The method of Claim 1, wherein compounds of the proteome are directed through the affinity elements by centrifugal force.

16. The method of Claim 15, wherein the array is washed by directing a wash solution through the array by centrifugal force.

17. The method of Claim 1, wherein each array includes at least twelve elements.

18. The method of Claim 1, wherein each array includes at least ninety-six elements.

19. The method of Claim 1, wherein at least a portion of the elements of the array includes an amount of resin packing in a range of between about 50 µl and about 100 µl.

20. The method of Claim 19, wherein the amount of eluent directed through each array element is in a range of between about 10 µl and about 100 µl.

21. The method of Claim 1, wherein the eluate is analyzed to identify eluted components of the proteome.

22. The method of Claim 1, wherein the eluent includes at least a portion of a chemical library.

23. The method of Claim 1, wherein each element of the affinity array includes at least a portion of a chemical library.

24. The method of Claim 1, wherein the elements of the affinity array and the eluent each includes a portion of at least one chemical library.

25. The method of Claim 1, wherein the proteome is distributed among elements of the affinity array.

26. The method of Claim 1, wherein the proteome is screened for components that are eluted from an element of the affinity array by competitive binding with an eluent comprising a proteome component.

27. The method of Claim 1, wherein the proteome is screened for components that are eluted from an element of the affinity array by competitive binding with an eluent comprising an element of the affinity array.

28. The method of Claim 1, wherein the proteome is screened for components that are eluted from an element of the affinity array by competitive binding with an eluent comprising a chemical library component.

29. The method of Claim 1, wherein each array element includes a plurality of ligands.

30. The method of Claim 29, wherein each array element includes at least ten ligands.

31. The method of Claim 1, wherein each eluent that is directed through an array element includes a plurality of distinct protein components that are candidates for selective release and elution of a proteome component from an affinity element.

32. The method of Claim 31, wherein each eluent component includes at least ten distinct protein components that are candidates for selective release of a proteome component from an affinity element.

33. The method of Claim 1, wherein the elements of the affinity array include a ligand that is bound to an inert support of each element in an orientation that is distinct from the orientation of the same ligand in at least one other element.

34. The method of Claim 1, further including analyzing the eluate by the steps:

a) first treating the eluate with an agent to fractionate the eluate; and

b) analyzing the fractionated eluate by nano-spray mass spectrometry, thereby analyzing the eluate.

35. The method of Claim 34, wherein the nano-spray mass spectrometry is electrospray ionization.

36. The method of Claim 35, wherein the electro spray ionization mass spectrometry is performed using a nano-needle array.

37. The method of Claim 34, wherein the agent to fractionate the eluate is an enzyme.

38. The method of Claim 37, wherein the enzyme is trypsin.

~~39.~~ An apparatus for screening a proteome, comprising:

a) an array of affinity elements, said affinity elements including at least one ligand; and

b) means for applying centrifugal force to said array, whereby an eluent can be directed through the array by centrifugal force and can release a

compound of the proteome that is bound to the ligand, thereby eluting the compound from the affinity element as a component of an eluate and screening the proteome.

40. The apparatus of Claim 39, wherein the means for applying centrifugal force includes a swing basket supporting the array, said swing basket including a hinge, whereby rotation of the swing basket about an axis causes the swing basket to rotate about the hinge, thereby causing centrifugal force on the affinity array to be parallel to an overall path of flow of eluent through elements of said array.

41. The apparatus of Claim 40, further including at least one tube sheet, whereby tube elements of the tube sheet can align with elements of the affinity array.

42. The apparatus of Claim 41, wherein the tube sheet is positioned between the hinge and the affinity array.

43. The apparatus of Claim 42, further including collection tubes that can be aligned with the elements of the affinity array, said collection tubes being positioned on a side of the affinity array opposite to that of the tube sheet.

44. The apparatus of Claim 43, wherein the tube sheet is moveable laterally relative to the flow of liquid from the tube sheet through the affinity array.

45. The apparatus of Claim 44, wherein the tube sheet further defines orifices between at least a portion of tubes of the tube sheet.

46. The apparatus of Claim 45, wherein the tube sheet is moveable between at least three positions, wherein each element of the affinity array is aligned with two

different tubes of the tube sheet in two of the position, and aligned with an orifice in the third position.

47. The apparatus of Claim 46, further including a centrifuge basket within which the swing basket is supported.

48. The apparatus of Claim 47, further including means for continuous directing at least one wash solution through the affinity array.

49. The apparatus of Claim 48, further including a wash solution source, and wherein the affinity array is in fluid communication with the wash solution source when the orifices of the tube sheet are aligned with elements of the affinity array.

50. The apparatus of Claim 41, wherein the tube sheet includes tubes that contain at least a portion of a proteome.

51. The apparatus of Claim 50, wherein elements of the tube sheet include distinct components or combinations of components of the proteome.

52. The apparatus of Claim 51, wherein elements of the tube sheet contain components of a chemical library.

53. The apparatus of Claim 52, wherein elements of the tube sheet include distinct components or combinations of components of the chemical library.

54. The apparatus of Claim 53, wherein movement of the tube sheet relative to the affinity array causes elements of the array to be aligned and in fluid communication with either elements of the tube sheet containing components of

a proteome, orifices of the tube sheet whereby fluid communication is established with a wash source, or elements of the tube sheet containing components of a chemical library.

55. The apparatus of Claim 54, further including magnetic means for moving the tube sheet.

56. The apparatus of Claim 55, wherein the collection tubes are moveable between a position that causes eluate from the affinity array to be collected in the centrifuge basket and a position that causes eluate from the affinity array to be collected in the collection tubes.

57. The apparatus of Claim 56, wherein the collection tubes are aligned for collection of eluate when the tube sheet is aligned for delivery of components of a chemical library to the affinity array.

58. The apparatus of Claim 57, wherein the elements of the tube sheet each include a disc that indicates the level of fluid in each element.

59. The apparatus of Claim 41, including a plurality of tube sheets at least one tube sheet containing at least a portion of a proteome, and at least one tube sheet containing components of a chemical library.

60. The apparatus of Claim 59, wherein the tube sheets are stacked.

61. The apparatus of Claim 60, further including means for selectively directing proteome wash or combinatorial library components through elements of the affinity array.

62. The apparatus of Claim 39 further including a nano-needle array, wherein the nano-needle array is aligned with the array of affinity elements, such that the nano-needle array collects the eluate.

63. The apparatus of Claim 62, wherein a nano-needle of the nano-needle array further includes an amount of hydrophobic resin in a range of between about 2μl and about 4μl.

64. The apparatus of Claim 63, wherein the nano-needle array can be detached from the array of affinity elements and mounted in a mass spectrometer, such that a nano-needle of the nano-needle array is aligned with an inlet orifice of the mass spectrometer for delivery of eluate to be analyzed by mass spectrometry.

65. The apparatus of Claim 64, wherein the mass spectrometry is nano-spray mass spectrometry.

66. The apparatus of Claim 65, wherein the nano-spray mass spectrometry is electrospray ionization.

67. The apparatus of Claim 66, wherein the delivery of the eluate to be analyzed by mass spectrometry is mediated by air pressure directed through a hollow push rod that is attached to the nano-needle that contains the eluate, thereby producing a spray of eluate directed into the inlet orifice of the mass spectrometer, thus delivering the eluate into the mass spectrometer for analysis.

68. The apparatus of Claim 67, wherein the nano-needle array can be moved in at least two dimensions to align a nano-needle of the nano-needle array with the inlet orifice of the mass spectrometer for delivery of the eluate to be analyzed by mass spectrometry.

69. The apparatus of Claim 68, wherein the alignment of a nano-needle of the nano-needle array is controlled by a computer.